

BIOLOGICAL EVALUATION OF GYPSY MOTH

At

RAYSTOWN LAKE

2008

Prepared by

**Rodney L. Whiteman
Forester**

**USDA Forest Service
Forest Health Protection
Morgantown, WV 26505**

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ABSTRACT

On September 22-25 and October 7, 2008, USDA Forest Service personnel conducted a gypsy moth egg mass survey at Raystown Lake. The purposes of the survey were to determine gypsy moth population densities, evaluate the efficacy of this year's treatments, assess the potential for defoliation and the need for treatment in 2009.

The US Army Corps of Engineers had proposed treatment of twelve areas that encompassed approximately 2100 acres in 2009. All twelve of these areas are valued for recreational purposes, wildlife habitat, aesthetics and or timber production. The high use areas at Seven Points, the new crop tree area and a portion of the timber sale area along Bakers Hollow Road were also surveyed.

Current populations are sufficient to cause light and heavy defoliation on 456 acres. Treatment is recommended to prevent defoliation, mast reduction, branch dieback and possible tree mortality.

METHODS

Gypsy moth survey plots were randomly selected based upon available host trees (oak species), size of sample area and uniformity between egg mass counts. At each sample point, a 1/40th acre fixed radius plot was established. The plots consisted of a tally of all the new (2008) egg masses observed on the overstory trees, understory vegetation, ground litter and duff. The total number of egg masses observed for each plot was multiplied by 40 to determine the number of egg masses per acre. Egg mass lengths were measured at the plots to determine the overall "health" of the existing population and as a measure of egg mass fecundity.

RESULTS

The location of the survey areas along with the survey plots are shown in Figures 1-8. The summarized results of the survey are presented in Tables 1-14. In brief, egg mass densities ranged from 0-4880 and averaged 376 egg masses per acre. Overall egg mass lengths tended to be moderate in size, ranging from 16-42 mm and averaging 26 mm.

Egg mass densities on the thirteen areas treated with a single application of *Bacillus thuringiensis* variety *kurstaki* (*Btk*) in 2008 (Figures 9a and 9b) have been reduced 99.5 percent from the pre-treatment level (2007) of 2826 to the current level of 16 egg masses per acre.

DISCUSSION

The basic guidelines used to evaluate the risk of defoliation include: previous defoliation events; number of egg masses/acre; size and condition of the egg masses; available preferred food; and risk of larval blow-in following egg hatch. Potential defoliation is categorized as; light (30-50 percent); and heavy (51-100 percent). Defoliation less than 30 percent generally has little impact on trees and can not be detected through aerial surveys.

The survey results indicate that light defoliation is expected on 375 acres and heavy defoliation on 81 acres at Raystown lake in 2009 (Figure 10)

This conclusion is further supported when egg density is used as a means of predicting defoliation. Moore and Jones (1987) found that estimating the mean fecundity would increase the precision of gypsy moth density estimates and that a linear relationship exists between egg mass length and fecundity. Further work by Liebhold et al., (1993) demonstrates that the product of the mean egg mass length (in mm) and egg mass density provides a more precise means of estimating population densities and prediction defoliation. Using Liebhold's model, Figure 11 shows how this information can be used to correlate the predicted defoliation of an area.

Accordingly, the estimated egg mass density of 983 egg masses per acre (average egg mass density in block 2) x 26 mm (average egg mass length in block 2) translates to a projected defoliation level of about 33 percent (light defoliation). Because egg mass densities and the host type are not evenly distributed, actual defoliation will vary from tree to tree but will be predominately heavy throughout Raystown Lake. Light defoliation is also predicted for the high use blocks and parts of block 4, 6, and 10 while heavy defoliation is predicted for blocks 9 and 13. No noticeable defoliation is predicted for blocks 1, 3, 5, 7, 8, 11 and 12.

Based on existing egg mass densities and the general size of egg masses, gypsy moth populations appear to be building and healthy in some areas, static in some areas and extremely low in other areas of Raystown Lake. The average egg mass length is 26 mm, Egg masses larger than 25 mm typically indicate healthy populations with no obvious stress from either the gypsy moth nucleopolyhedrosis virus (NPV) or the *Entomophaga maimaiga* fungus, two of the primary natural control agents that often express themselves in declining or stressed populations. There was no evidence that either one of these entomopathogens had significant impacts at Raystown Lake in 2008. Although it is still possible that either the gypsy moth fungus or the NPV could cause the general collapse of the gypsy moth population next year, it is unlikely that populations will collapse prior to a significant defoliation event occurring in 2009.

Predicting the extent of tree mortality that would occur after one year's defoliation is difficult, however, a stand of trees that is not stressed by other agents during or immediately following a single heavy defoliation will likely pull through with only minor branch dieback and minimal mortality. Trees that are defoliated in excess of 60 percent normally refoliate the same growing season. Such events cause the trees to expend valuable energy reserves to refoliate, and consequently cause the trees' health to deteriorate. Depending on the condition of the trees at the time of defoliation, reduced growth, mast abortion, branch dieback or in some cases tree mortality, has occurred following a single year of heavy defoliation. Should subsequent defoliation occur the following year, the impact is compounded. Trees that receive light defoliation (<50 percent) are not likely to refoliate and there is probably no significant impact other than a reduction in growth, reduction of mast and possibly some minor branch dieback. Trees at greater risk are those that are presently stressed from other factors, such as soil compaction from roads, sidewalks, parking lots, machinery and/or heavy foot travel; over maturity; drought; shock due to recent timber cutting activities; previous year(s) defoliation; and other insect and disease related problems. Raystown Lake experienced a prolonged and severe drought during the 2007 growing season, and again during the late portion of the 2008 growing season. Approximately 671 acres of defoliation were detected at Raystown Lake in 2007 and 39.2 acres in 2008. Less than 1 acre of the defoliation was detected within the 2008 treatment

areas. The defoliation that was detected in 2008 along with the 2008 treatment areas are shown in Figures 9a and 9b.

The Allegheny National Forest (1988) and the West Virginia Division of Forestry (1997) provide examples of the potential tree mortality that can occur. On the Allegheny National Forest, untreated stands consisting of 40-80 percent oak, the average loss of basal area (mainly oaks) was about 16 percent (range 3-28 percent) following one year of defoliation and 26 percent (range 10-43 percent) after two consecutive years of defoliation. In a 1986 study area in eastern West Virginia where oak species accounted for 63-78 percent of the species composition, a loss of 25 percent of the total oak saw timber and 14 percent of the total oak pole timber occurred after one year of light to heavy defoliation. In these examples, droughty conditions likely contributed to the level of mortality.

Based on observations of the existing health of the forested areas at Raystown Lake and the factors mentioned above, scattered areas of tree mortality are expected if defoliation occurs. Mortality will be more severe if adequate rainfall is not received during the 2009 growing season.

Management Options

In 2009, two management options have been evaluated for managing gypsy moth populations at Raystown Lake. The intervention options are offered based upon the following two treatment objectives: 1) protect host tree foliage to prevent mast failure, branch dieback and tree mortality; and 2) reduce gypsy moth population below the treatment threshold. Each is discussed below.

No Action Option

It is possible that gypsy moth populations could collapse on their own due to the presence of nucleopolyhedrosis virus (NPV) or the more recently recognized fungal pathogen, *Entomophaga maimaiga*. In areas with defoliating levels of gypsy moth populations, viral epizootics generally manifest themselves after significant tree defoliation has already occurred. Gypsy moth populations will usually peak in 2-3 years once they reach levels and then collapse as a result of NPV or fungal activity. Residual populations following such a collapse will likely remain at low densities for 3-6 years before rebuilding to defoliating levels.

Although it is not possible to accurately assess such events with the defoliating levels and then collapse as a result of NPV or fungal activity. Residual populations information at hand, it is unlikely that a collapse will occur in 2009 since most of these areas are either newly infested and/or there is an abundance of fairly healthy egg masses.

Large numbers of gypsy moth caterpillars and defoliation has been shown to impact competing native herbivore arthropods. Sample et al., (1996) showed short-term impacts of both species richness and abundance occurred following light to moderate defoliation events in study plots in West Virginia. It is likely that impacts would be greater as the size of the area and intensity of defoliation increases and be more long term, should extensive tree mortality occur.

Should this option be selected, it is likely that areas of light and heavy defoliation will occur at Raystown Lake in 2009

Microbial Insecticide Option

***Btk*:** The only biological insecticide currently registered and commercially available for gypsy moth control is the microbial insecticide *Bacillus thuringienis* variety *kurstaki* (*Btk*). This insecticide is available through several manufacturers and has been used extensively in suppression projects throughout the U.S. in both forested and residential areas. *Btk* is a bacterium that acts specifically against lepidopterous larvae as a stomach poison and therefore must be ingested. The major mode of action is by mid-gut paralysis which occurs soon after feeding. This results in a cessation of feeding, and death by starvation. *Btk* is persistent on foliage for about 7-10 days.

Btk has been shown to impact other non-target caterpillars that are actively feeding at the time of treatment. An example of the potential impacts is provided by a study conducted by Miller (1990) in Oregon and Samples, et al., (1996) in West Virginia. Miller's study involved a large scale (5,000 acres) eradication program where three consecutive applications of *Btk* were applied within a single season. On Garry oak, Miller found that species richness was significantly reduced in treated areas during all 3 years of the study while the total number of immature native Lepidoptera rebounded after the second year. In the Sample study, the areas treated with *Btk* were 50 acre plots and only a single treatment applied. Here too, both species richness and the total numbers of native macro-lepidopterous caterpillars and adults were reduced but only for less than 1 year. The difference in duration of the impacts between these studies is probably the result of the number of treatment applications applied and the size of the treatment area involved.

Btk formulations are available as flowable concentrates, wettable powders, and emulsifiable suspensions. The normal application rates range from 24-36 billion international units (BIUs) per acre in a single or double application. *Btk* can be applied either undiluted or mixed with water for a total volume of ½ -1 gallon per acre. With proper application, foliage protection and some degree of population reduction can be expected with one application and with two applications both foliage protection and a greater degree of population reduction are likely.

Because *Btk* is a biological insecticide, the degree of population reduction varies and may depend on, at least in part, the selected application rate, relative health of the population (building vs. declining), population densities, weather (rain and temperature), the feeding activity of the larvae following treatment, and the actual potency of the product.

Gypchek: A second microbial insecticide that is registered and available in limited quantities is the formulated nucleopolyhedrosis virus called Gypchek. This product is not available commercially but is produced in limited quantities by a cooperative effort of the USDA Forest Service and the Animal Plant Health Inspection Service (APHIS). The active ingredient in Gypchek formulations has a very narrow host range (lymnatriids) and occurs naturally in gypsy moth populations. Normally the virus reaches epizootic proportions when gypsy moth populations reach high densities as a result of increased transmission within and between gypsy moth generations. The application of Gypchek to gypsy moth populations simply expedites this

process by increasing the exposure of the virus at an earlier stage. Healthy, feeding gypsy moth caterpillars become infected by ingesting contaminated foliage and soon stop feeding and die.

The efficacy of Gypchek treatments to reduce gypsy moth populations has been quite variable. Because of the short period of viral activity on foliage (3-5 days) as well as other biological factors such as feeding activity and weather conditions, it has been difficult at best to project treatment efficacy. Most often foliage protection can be achieved but significant reductions in gypsy moth densities do not always occur. Should inadequate population reduction occur, areas would need to be treated again the following year.

The normal application rate of Gypchek is 4×10^{11} occlusion bodies (OB's) per acre applied in a single application or 2×10^{11} OB's per acre applied in a double application. Due to the limited supply, priority is first given to state and federal cooperators that need to deal with federally listed threatened and endangered species associated with gypsy moth treatments. There are, however, sufficient quantities of Gypchek currently available for 2009 should this insecticide be preferred for use at Raystown Lake.

Alternatives

With the previously described options in mind, the following alternatives are offered:

- | | |
|----------------|--|
| Alternative 1. | - No action. |
| Alternative 2. | - One aerial application of <i>Btk</i> at the rate of 36 BIUs in a total mix of $\frac{3}{4}$ gallon per acre. |
| Alternative 3. | - Two aerial applications of <i>Btk</i> , as in alternative 2, applied 4-7 days apart. |
| Alternative 4. | - One aerial application of Gypchek at the rate of 4×10^{11} OB's in a total mix of $\frac{3}{4}$ gallon per acre. |
| Alternative 5. | - Two aerial applications of Gypchek at the rate of 2×10^{11} OB's in a total mix of $\frac{3}{4}$ gallon per acre, applied 3-5 days apart. |

RECOMMENDATIONS

As previously stated, gypsy moth populations at Raystown Lake are sufficient to cause light defoliation on 375 and heavy defoliation on 81 acres in 2009. To protect tree foliage, prevent branch dieback and prevent tree mortality, our recommendation is alternative 2 (a single application of Btk).

This recommendation is based on the following considerations:

- 1) The current gypsy moth population levels do not warrant a double application of Btk.
- 2) A single application of Btk is likely to provide both foliage protection and a significant population reduction.
- 3) Gypchek is less likely to provide adequate foliage protection or a significant population reduction than Btk.
- 4) There are known threatened or endangered species in the treatment areas.

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Table 1. – Gypsy moth egg mass survey results in Block 1
at Raystown Lake on September 22, 2008.

Plot #	# em/acre	em size (mm)
1 ^z	0	--
2 ^z	0	--
3 ^z	0	--
4 ^z	0	--
5 ^z	40	22
6 ^z	0	--

egg mass/acre range = 0-40
egg mass/acre average = 7

egg mass size average (mm) = 22

^z= plot located in 2008 treatment block

Table 2. – Gypsy moth egg mass survey results in Block 2
at Raystown Lake on September 23, 2008.

Plot #	# em/acre	em size (mm)
1 [*]	1920	28
2 [*]	1000	24, 34, 34
3 [*]	1540	20, 26, 24
4 [*]	960	20, 24, 34
5 ^{*z}	320	22
6 ^{*z}	160	--

egg mass/acre range = 160-1920
egg mass/acre average = 983

egg mass size range (mm) = 20-34
egg mass size average (mm) = 26

* = recommended treatment block is the entire proposed block

^z= plot located in 2008 treatment block

Table 3. – Gypsy moth egg mass survey results in Block 3
at Raystown Lake on September 24, 2008.

Plot #	# em/acre	em size (mm)
1	120	20
2	0	--
3 ^z	0	--
4 ^z	0	--
5 ^z	0	--

egg mass/acre range = 0-120
egg mass/acre average = 24

egg mass size average (mm) = 20

^z= plot located in 2008 treatment block

Table 4. – Gypsy moth egg mass survey results in Block 4
at Raystown Lake on September 22 and 23, 2008.

Plot #	# em/acre	em size (mm)
1	40	--
2	0	--
3	0	--
4*	440	
5*	1080	24, 26
6	80	32, 24, 22
7	0	--
8*	1480	--
9*	520	42, 24, 32
10	0	28, 28, 26
11	40	--
12	0	--
13	0	--
14	0	--
15 ^z	0	--
16 ^z	0	--
17* ^z	1280	32,26, 28
18*	400	26
19	0	--
20	0	--
21	0	--
22	0	--
23	0	--
24	0	--
25	0	--

egg mass/acre range = 0-1480

egg mass/acre average = 208

egg mass size range (mm) = 22-42

egg mass size average (mm) = 28

* = plot located in recommended treatment blocks

egg mass/acre range in recommended treatment blocks = 400-1280

egg mass/acre average in recommended treatment blocks = 867

egg mass size range (mm) in recommended treatment blocks = 22-42

egg mass size average (mm) in recommended treatment blocks = 28

^z = plot located in 2008 treatment block

Table 5. – Gypsy moth egg mass survey results in Block 5
at Raystown Lake on September 24, 2008.

Plot #	# em/acre	em size (mm)
1 ^z	0	--
2 ^z	0	--
3 ^z	0	--
4 ^z	0	--
5 ^z	0	--

egg mass/acre average = 0

^z= plot located in 2008 treatment block

Table 6. – Gypsy moth egg mass survey results in Block 6
at Raystown Lake on September 24, 2008.

Plot #	# em/acre	em size (mm)
1	120	26
2	0	--
3	0	--
4*	840	40, 28

egg mass/acre range = 0- 840

egg mass size range (mm) = 26-40

egg mass /acre average = 240

egg mass size average (mm) = 31

*= plot located in recommended treatment block

egg mass/acre average in recommended treatment block =840

egg mass size range (mm) in recommended treatment blocks = 28-40

egg mass size average (mm) in recommended treatment blocks = 34

Table 7. – Gypsy moth egg mass survey results in Block 7
at Raystown Lake on September 25, 2008.

Plot #	# em/acre	em size (mm)
1 ^z	0	--
2 ^z	80	24
3	120	26
4 ^z	0	--
5 ^z	0	--
6 ^z	0	--

egg mass/acre range = 0-120

egg mass size range (mm) = 24-26

egg mass/acre average = 33

egg mass size average(mm) = 25

^z= plot located in 2008 treatment block

Table 8. – Gypsy moth egg mass survey results in Block 8
at Raystown Lake on September 23, 2008.

Plot #	# em/acre	em size (mm)
1	0	--
2	120	22
3 ^z	40	--
4 ^z	0	--
5 ^z	200	26
6 ^z	40	16
7 ^z	0	--
8	0	--
9	40	--
10	0	--
11	0	--
12	200	18
13	80	24

egg mass/acre range = 0-200

egg mass/acre average = 55

egg mass size range (mm) = 16-26

egg mass size average(mm) = 21

^z = plot located in 2008 treatment block

Table 9. – Gypsy moth egg mass survey results in Block 9
at Raystown Lake on September 23, 2008.

Plot #	# em/acre	em size (mm)
1*	560	26, 24
2*	4840	24, 32, 34
3*	1560	22, 24, 34
4*	1840	28

egg mass/acre range = 560-4840

egg mass/acre average = 2200

egg mass size range (mm) = 22-34

egg mass size average = 28

* = recommended treatment block is the entire proposed block

Table 10. – Gypsy moth egg mass survey results in Block 10
at Raystown Lake on September 23, 2008.

Plot #	# em/acre	em size (mm)
1	0	--
2	0	--
3	0	--
4	0	--
5*	1520	36, 34
6*	920	30
7*	880	24
8*	520	24

egg mass/acre range = 0-1520

egg mass/acre average = 480

egg mass size range (mm) = 24-36

egg mass size average(mm) = 30

* = plot located in recommended treatment block

egg mass/acre range in recommended treatment area = 520-1520

egg mass/acre average in recommended treatment area = 960

egg mass size range (mm) in recommended treatment area = 24-36

egg mass size average (mm) in recommended treatment area = 30

Table 11. – Gypsy moth egg mass survey results in Block 11
at Raystown Lake on September 24, 2008.

Plot #	# em/acre	em size (mm)
1	0	--
2 ^z	0	--
3 ^z	0	--
4 ^z	0	--
5 ^z	0	--
6 ^z	0	--
7 ^z	0	--
8 ^z	0	--
9 ^z	0	--
10 ^z	0	--
11 ^z	0	--

egg mass/acre average = 0

^z = plot located in 2008 treatment block

Table 12. – Gypsy moth egg mass survey results in Block 12
at Raystown Lake on October 7, 2008.

Plot #	# em/acre	em size (mm)
1 ^z	0	--
2 ^z	0	--
3 ^z	0	--
4 ^z	0	--
5 ^z	0	--
6 ^z	0	--

egg mass /acre average = 0

^z= plot located in 2008 treatment block

Table 13. – Gypsy moth egg mass survey results in Block 13
at Raystown Lake on September 25, 2008.

Plot #	# em/acre	em size (mm)
1*	3160	32, 40, 26
2*	640	24
3*	2160	24, 36, 30
4	120	24
5*	400	34, 32
6*	4880	32, 26, 28

egg mass/acre range = 120-4880

egg mass/acre average = 1893

egg mass size range (mm) = 24-40

egg mass size average(mm) = 30

* = plot located in recommended treatment block

egg mass/acre range in recommended treatment area = 640- 4880

egg mass/acre average in recommended treatment area = 2248

egg mass size range (mm) in recommended treatment area = 24-40

egg mass size average (mm) in recommended treatment area = 30

Table 14. – Gypsy moth egg mass survey results in high use areas at the Seven Points area of Raystown Lake on September 23 and 24, 2008.

Plot #	Area	# em/acre	em size (mm)
1*	Point Camp	680	24, 28
2*	Point Camp	400	24, 32
3*	Point Camp	400	34
4*	Dogwood Picnic Shelter	240	26
5*	Dogwood Picnic Shelter	80	--
6*	Dogwood Picnic Shelter	1040	24, 26
7*	Allegheny Picnic area	760	32, 24 22
8*	Allegheny Picnic area	240	32, 32
9*	90° turn in road	480	26, 24
10*	Turn Hollow Picnic Area	840	28, 22, 24
11*	near beach house	480	24
12*	Senoia Camp	840	26, 24
13*	Senoia Camp	920	24, 26, 24
14*	Senoia Camp	1240	28, 26, 24
15*	Senoia Camp	480	28
16	Senoia Camp	40	--

egg masses/acre range = 40-1240

egg masses/acre average = 573

egg mass size range (mm) = 22-34

egg mass size average = 26

* = plot located in recommended treatment area

egg mass/acre range in recommended treatment area = 80-1240

egg mass/acre average in recommended treatment area = 6081

egg mass size range (mm) in recommended treatment area = 22-34

egg mass size average (mm) in recommended treatment area = 26

Figure 1. -- Gypsy moth egg mass survey plot locations established in Block 1 at Raystown Lake on September 22, 2008.



-  0 em/acre
-  1-250 em/acre
-  251-1,000 em/acre
-  1,001-5000 em/acre
-  > 5,001 em/acre

-  Proposed treatment blocks
-  Raystown Lake Boundary



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0 0.05 0.1 0.2
Miles

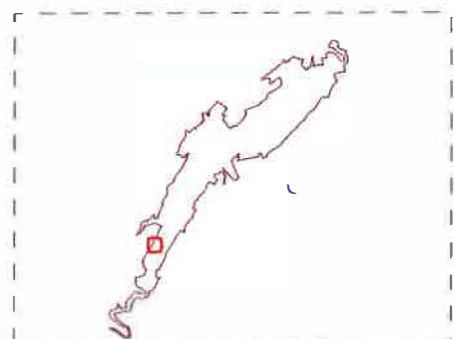
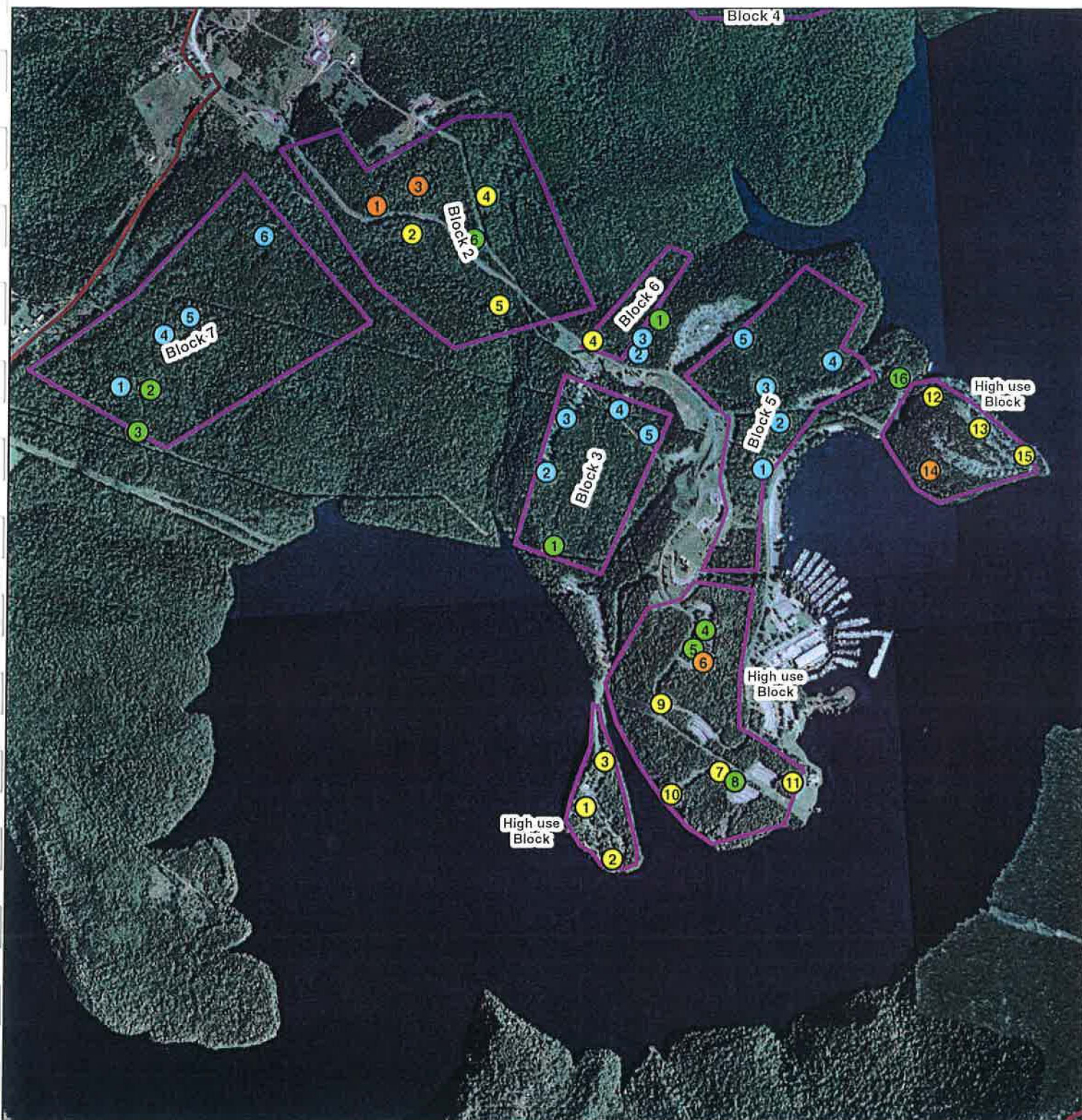


Figure 2. -- Gypsy moth egg mass survey plot locations established in Blocks 2, 3, 5, 6, 7 and high use areas of Seven Points at Raystown Lake on September 23-25, 2008.



-  0 em/acre
-  1-250 em/acre
-  251-1,000 em/acre
-  1,001-5,000 em/acre
-  > 5,001 em/acre
-  Proposed treatment blocks
-  Raystown Lake Boundary

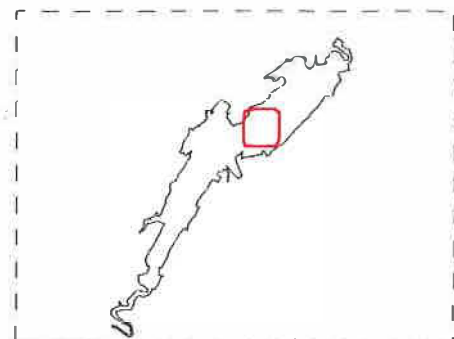
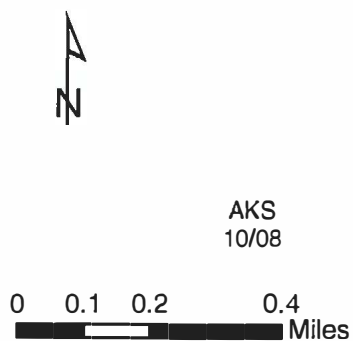


Figure 3. -- Gypsy moth egg mass survey plot locations established in Block 4 at Raystown Lake on September 22 and 23, 2008.



- 0 em/acre
- 1-250 em/acre
- 251-1,000 em/acre
- 1,001-5,000 em/acre
- > 5,001 em/acre

- Proposed treatment blocks
- Raystown Lake Boundary

0 0.050.1 0.2
Miles

AKS
10/08

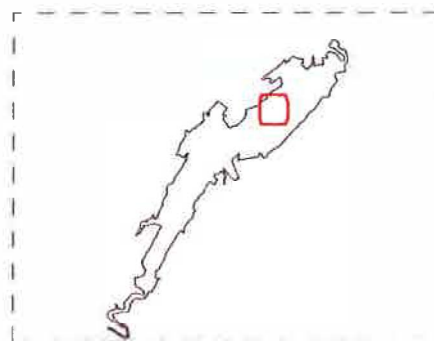


Figure 4. -- Gypsy moth egg mass survey plot locations established in Block 8 and 9 at Raystown Lake on September 23, 2008.



- 0 em/acre
- 1-250 em/acre
- 251-1,000 em/acre
- 1,001-5,000 em/acre
- > 5,001 em/acre

- Proposed treatment blocks
- Raystown Lake Boundary



0 0.05 0.1 0.2
Miles

AKS
10/08



Figure 5. -- Gypsy moth egg mass survey plot locations established in Block 10 at Raystown Lake on September 23, 2008.



- 0 em/acre
- 1-250 em/acre
- 251-1,000 em/acre
- 1,001-5000 em/acre
- > 5,001 em/acre

- Proposed treatment blocks
- Raystown Lake Boundary



AKS
10/08
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Miles

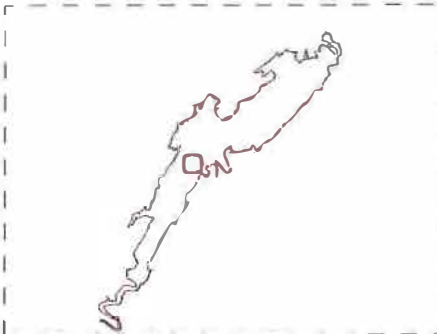


Figure 6. -- Gypsy moth egg mass survey plot locations established in Block 11 at Raystown Lake on September 24, 2008.

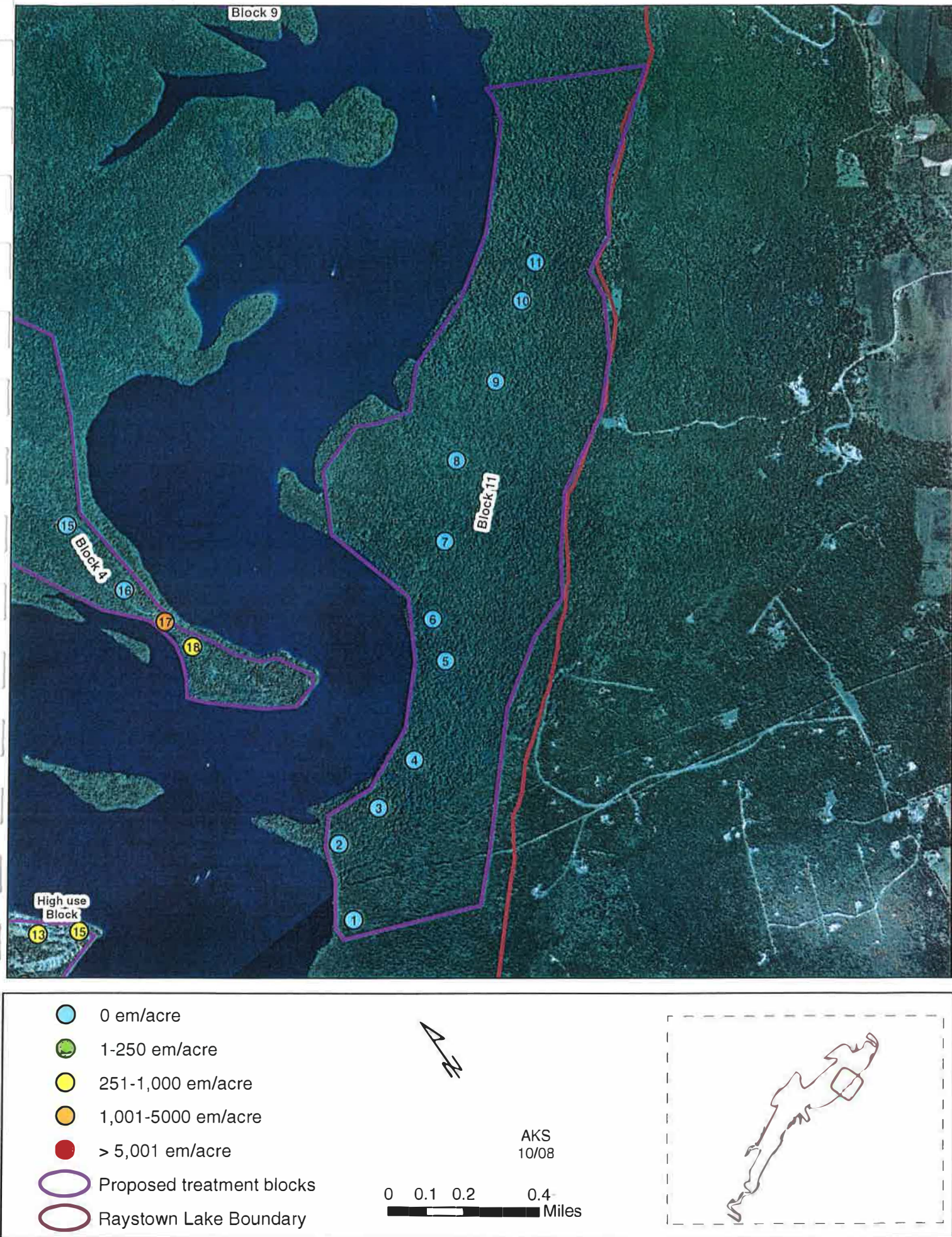


Figure 7. -- Gypsy moth egg mass survey plot locations established in Block 12 at Raystown Lake on October 7, 2008.

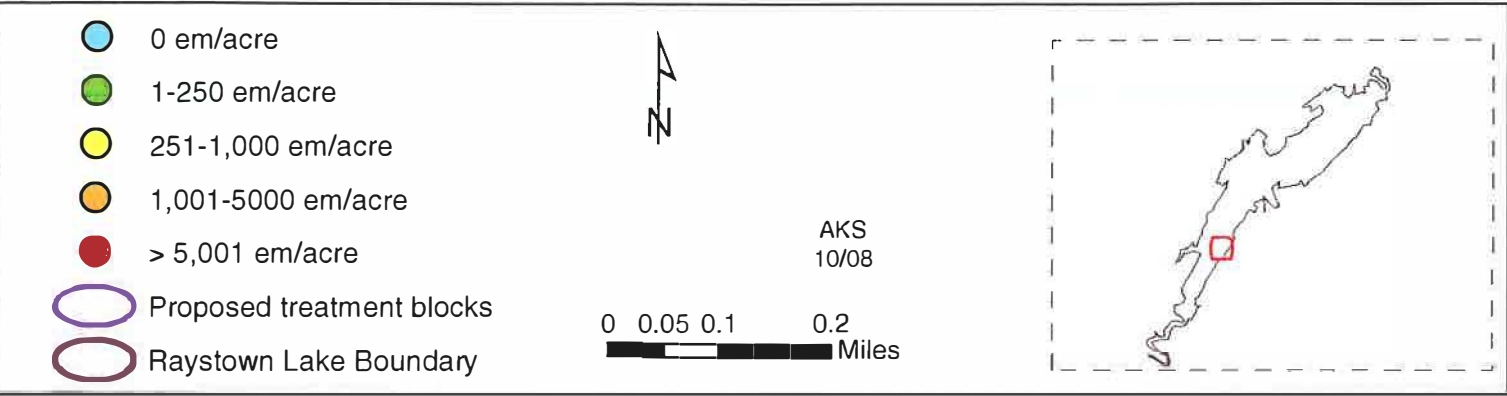
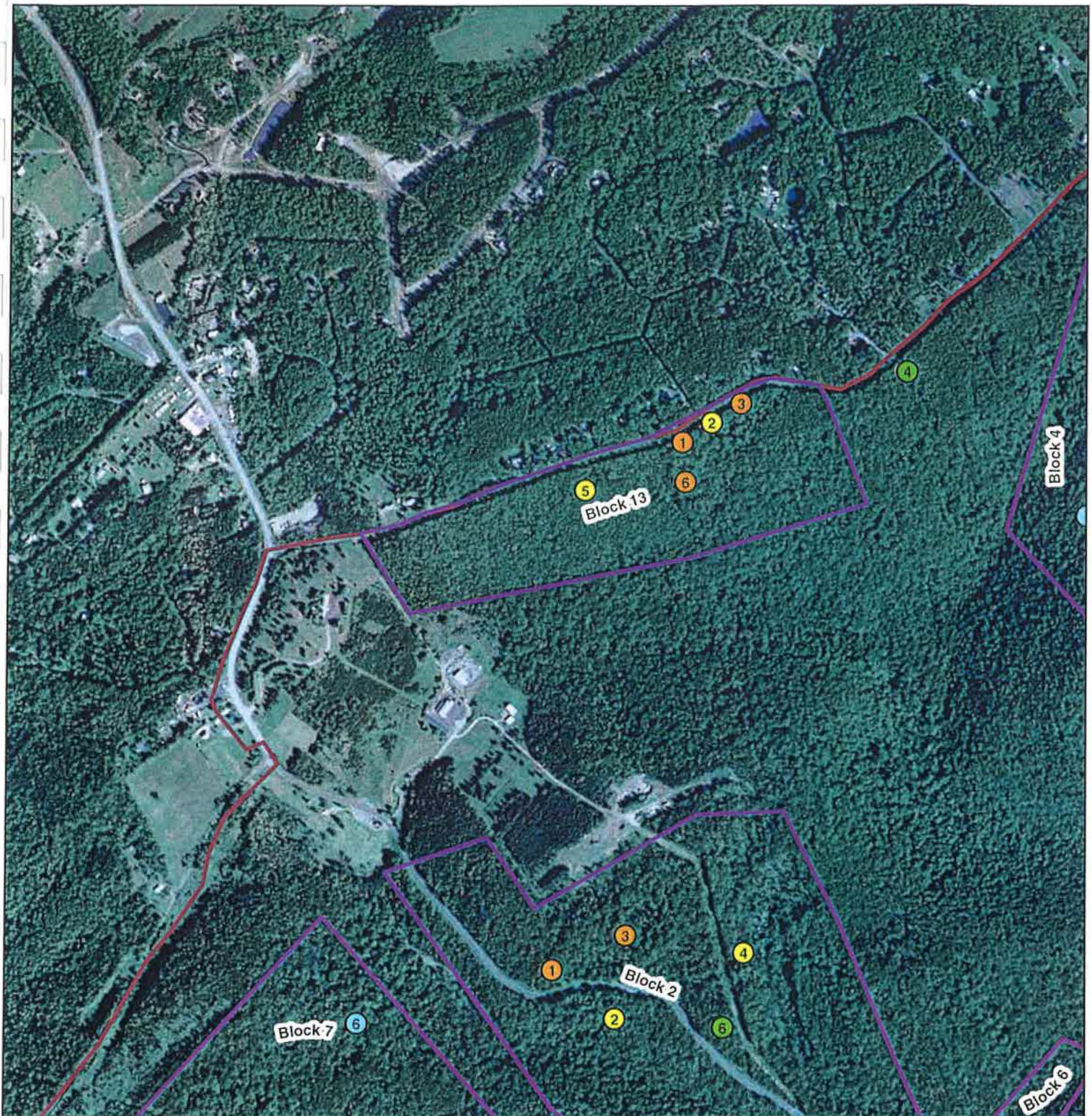


Figure 8. -- Gypsy moth survey plot locations established at The Bakers Hollow Road Block (Block 13) on September 25 and October 7, 2008.



- 0 em/acre
- 1-250 em/acre
- 251-1,000 em/acre
- 1,001-5,000 em/acre
- > 5,001 em/acre

- Proposed treatment blocks
- Raystown Lake Boundary

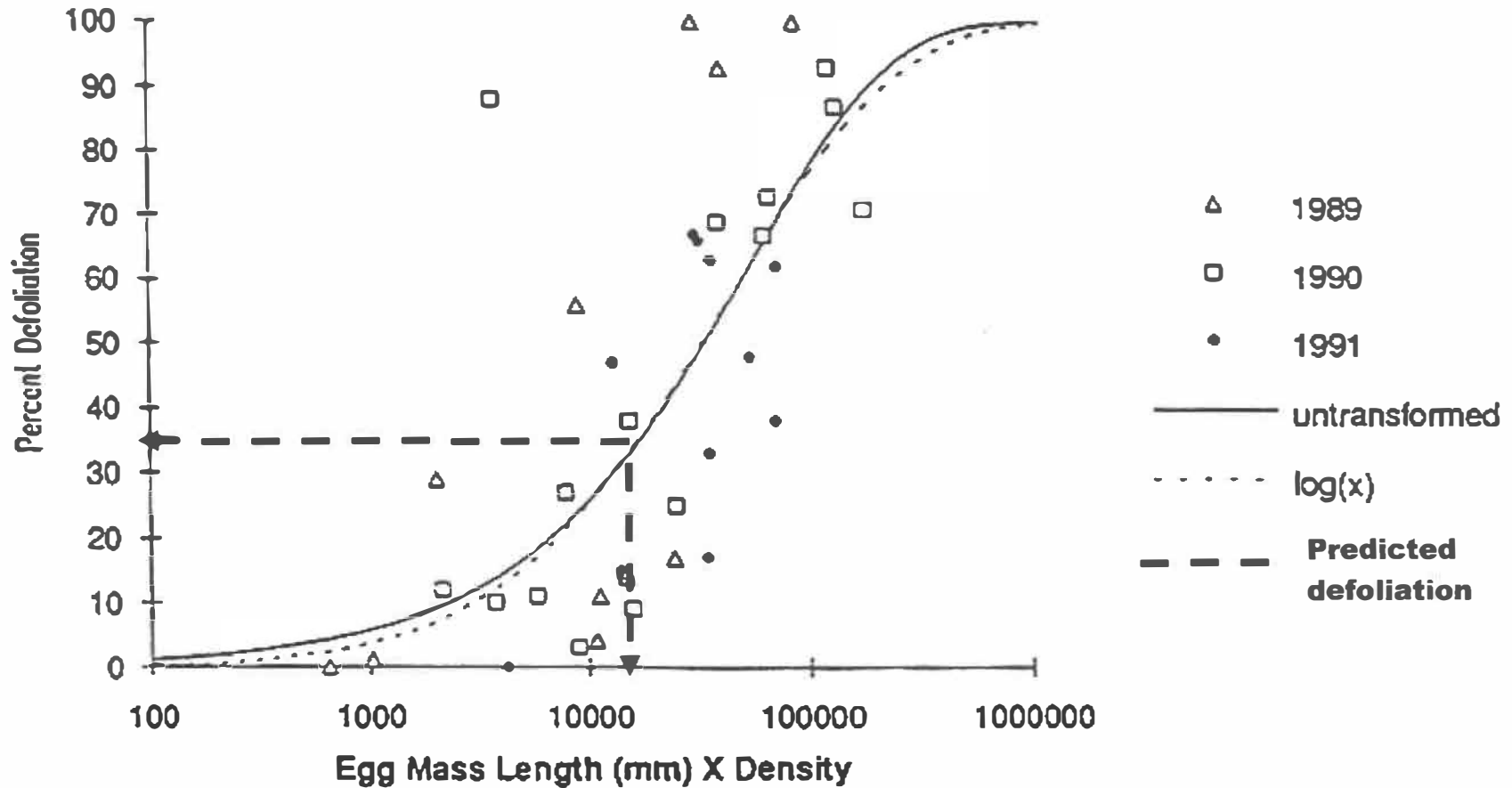


0 0.05 0.1 0.2 Miles

AKS
10/08



Figure 11.—Predicted defoliation in block 2 at Raystown Lake in 2009.



**Scatter plot of the product of mean egg mass length and egg mass density versus mean defoliation.
Extracted from Liebhold et al. (1993).**

Figure 9a. -- Results of the aerial survey conducted at Raystown Lake on June 23, 2008, along with the 2008 treatment areas (northern half).

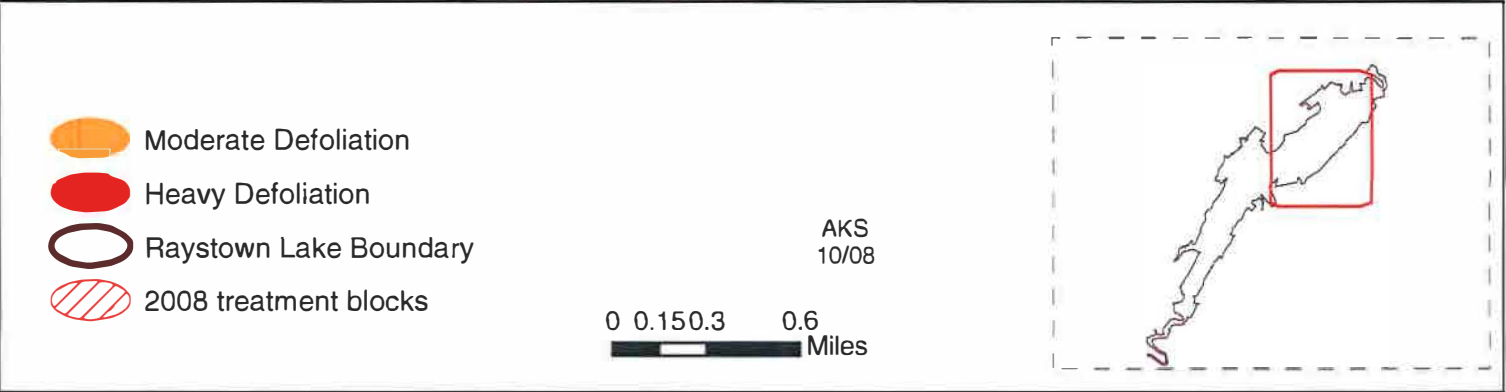


Figure 9b. -- Results of the aerial survey conducted at Raystown Lake on June 23, 2008, along with the 2008 treatment areas (southern half).

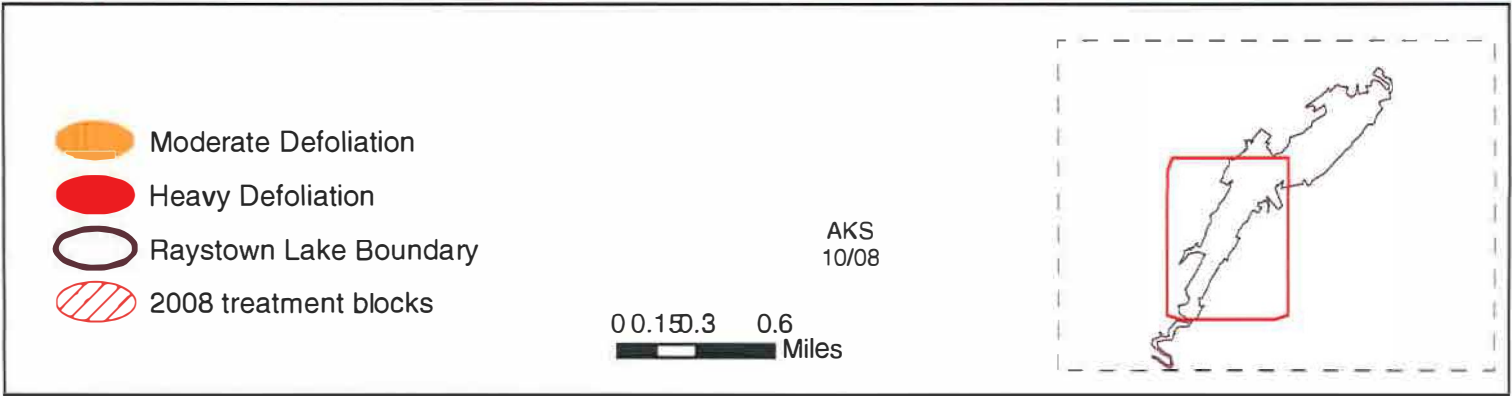
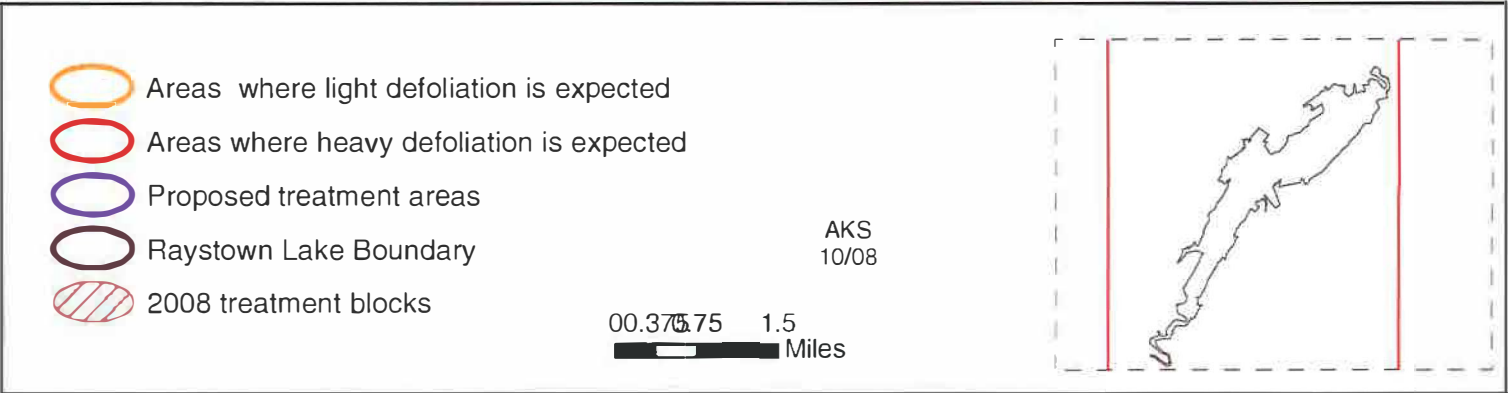
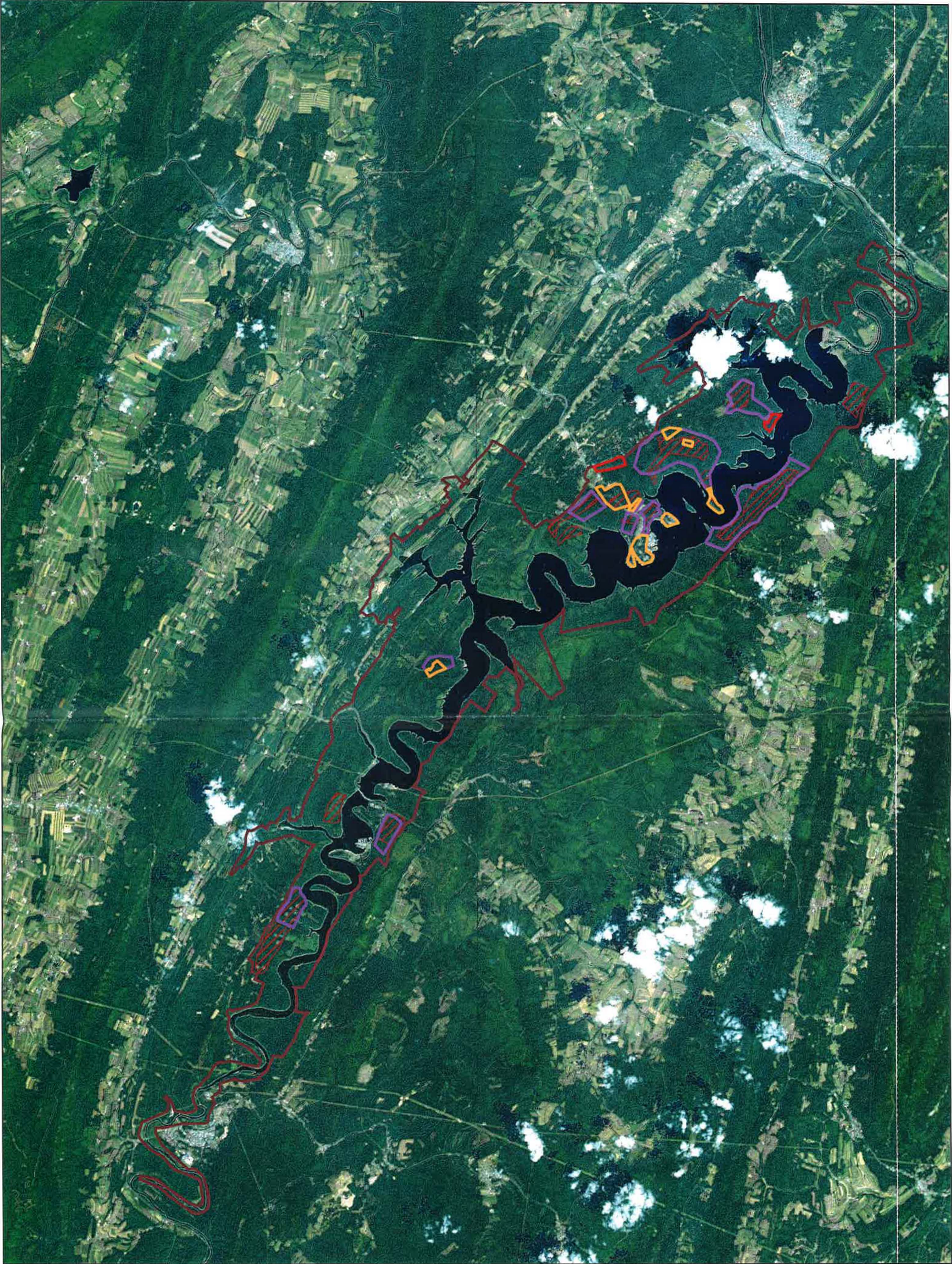


Figure 10. -- Areas where defoliation is likely/recommended treatment areas at Raystown Lake in 2009.





United States
Department of
Agriculture

Forest
Service

Northeastern Area
State and Private Forestry

180 Canfield Street
Morgantown, WV 26505-3101

File Code: 3410

Date: October 14, 2008

Mr. Dwight Beall
Raystown Lake
US Army Corps of Engineers
RR1, Box 222
Hesston, PA 16647

Dear Dwight:

Enclosed is the gypsy moth biological evaluation for Raystown Lake.

In brief, gypsy moth populations are sufficient to cause light defoliation on 275 acres and heavy defoliation on 81 acres. We are recommending a single application of *Bacillus thuringiensis* variety *kurstaki* (*Btk*) on the 456 acres. With good timing and proper application, gypsy moth defoliation should be minimal at Raystown Lake in 2009.

I would like to thank your staff for conducting the preliminary egg mass survey.

Please contact me at 304-285-1555 if you have any questions regarding the gypsy moth biological evaluation.

Sincerely,

RODNEY L. WHITEMAN
Forester
Forest Health Protection

Enclosure

Cc: Jeff Krause, Raystown Lake
Lacy Evans, Baltimore District ACE
Tim Morasco, PA BOF
Robert Lueckel, MFO

RLW/blm

